The Player and the Dice: Physics and Critical Legal Theory

"God does not play at dice."

—Albert Einstein[1]

I. INTRODUCTION

In the middle to late 1970s a movement arose within legal studies that developed a critique of traditional legal scholarship.[2] The new movement has become known as Critical Legal Studies (CLS).[3] A huge body of literature has grown around CLS and critiques of CLS tenets. The CLS school is difficult to characterize, partly because of the differences in philosophy among critical legal scholars (CRITs) themselves.[4] However, CLS can probably best be described as a legal studies movement that attempts to show how the principles of traditional legal scholarship have served to justify domination and privilege, while embracing an epistemology that claims neutrality and predictability.[5] It is not surprising, therefore, that the movement disturbs and even alarms the mainstream of legal scholarship.

One commentator has suggested that the philosophical underpinnings of the CLS movement can be traced to the revolution in physics that occurred early in the twentieth century.[6] Physics in the early twentieth century, particularly the work of Albert Einstein and Werner Heisenberg, altered the deterministic

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[1] This famous quotation of Einstein's arose from his inability to accept the indeterminism of quantum mechanics as developed by Heisenberg and others. Einstein made the remark so often that Niels Bohr finally retorted. *See infra* note 145 and accompanying quotation. *See also* J. BRONOWSKI, THE ASCENT OF MAN 256 (1973).

[2] *See generally* Minda, *The Jurisprudential Movements of the 1980s*, 50 OHIO ST. L.J. 599, 614 (1989).

[3] Critical Legal Studies is named for a loose network of legal scholars formed in 1977 called the Conference on Critical Legal Studies. For a sampling of CLS views see Frug, *The City as a Legal Concept*, 93 HARV. L. REV. 1057 (1980); Gabel & Kennedy, *Roll over Beethoven*, 36 STAN. L. REV. 1 (1984); Kennedy, *The Structure of Blackstone's Commentaries*, 28 BUFFALO L. REV. 209 (1979); Tushnet, *Legal Scholarship: Its Causes and Cure*, 90 YALE L.J. 1205 (1981). These works have a distinctly irrationalist flavor. See *infra* notes 11 & 18 and accompanying text.

[4] Minda, *supra* note 2, at 615.

[5] *Id.* at 615–17; Minnow, *Law Turning Outward*, 73 TELOS 79, 83 (1986).

[6] Williams, *Critical Legal Studies: The Death of Transcendence and the Rise of the New Langdells*, 62 N.Y.U. L. REV. 429, 436–39 (1987); *see also* Chow, *Trashing Nihilism*, 65 TUL. L. REV. 221, 242–43 (1990).

world-view of Newtonian physics.[7] This set in motion a revolution in thinking in a number of fields, including philosophy and literature.[8] At least one commentator sees CLS as the attempt to incorporate this "new epistemology" into legal scholarship as well.[9]

The purpose of this Note is to compare the discoveries of twentieth-century physics with the law. The topic of science and the law is vast, and will not be dealt with in its entirety; instead, a few aspects of modern physics will be explored in the context of the ideas of Critical Legal Studies.[10] Several aspects of modern physics are ignored by CLS and other branches of the new epistemology. These factors will be examined and their implications for CLS discussed. It is not suggested here that a strict scientific analogy for the law is valid. The comparison of physics and CLS is made for two reasons. First, the comparison shows that CLS is not consistent with its philosophical origins in the physics of the early twentieth century. Second, the findings of physics, though not forming a strict analogy, are useful in exploring some aspects of the law in the context of CLS ideas. The hope is that CLS and legal studies in general might benefit by comparison, not with the epistemology as filtered through the lenses of philosophy and linguistics, but directly with the scientific findings themselves.

In Part II of this Note, the basic arguments and tenets of CLS will be described. This description will necessarily be only an outline; the great diversity of views within CLS is a limiting factor. The ideas that are discussed in Part II are taken to a large extent from a paper by Joseph Singer.[11] Singer's paper was chosen to represent the views of CLS because his ideas are explained in clear language, because the ideas he presents are similar to those discussed by other CRITs, and because he is a representative of the "irrationalists." Irrationalists are the group within CLS who reject most vehemently the ideas of traditional legal theory and even legal realism. Thus, irrationalists represent most closely the legal manifestation of the second wave of the new epistemology.[12]

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[7] *See* Chow, *supra* note 6, at 242 n.81; Williams, *supra* note 6, at 437–39. *See also* J. BRONOWSKI, supra note 1, at 221–25; S. HAWKING, A BRIEF HISTORY OF TIME 55 (1988).

[8] Chow, *supra* note 6, at 243–46; Williams, *supra* note 6, at 449–69.

[9] The term "new epistemology" is one used by Williams; *see* Williams, *supra* note 6, at 430.

[10] For a detailed discussion of the scientific model of the law, see Note, *The Scientific Model in Law*, 75 GEO. L.J. 1967 (1987).

[11] Singer, *The Player and the Cards: Nihilism and Legal Theory*, 94 YALE L.J. 1 (1984).

[12] *See* Williams, *supra* note 6, at 488–91 for discussions of the new epistemology and its influence on legal realism and CLS.

In Part III, the philosophical background of the new epistemology, culminating in its incorporation into CLS theory, is briefly outlined.[13] In Part IV, a comparison is made of the findings of modern physics and the ideas of the new epistemology and CLS. An analysis of the law by way of analogy with modern physics is proposed.

II. CRITICAL LEGAL STUDIES

CLS is difficult to characterize because it consists of a loosely connected group of scholars with widely diverse views.[14] There have been, however, attempts to describe a central philosophy to the CLS movement.[15] In a phrase, CLS is legal atheism; the central tenet of CLS is that there is no absolute or transcendental source for the law. Rather, the law varies according to time and place, and is not neutral, objective, or deterministic.[16] In addition, according to CLS, legal reasoning serves to justify and promote domination and rigid hierarchy by those in power.[17] Joseph Singer claims that traditional legal theory has three basic tenets that are susceptible to critique: Determinacy, objectivity, and neutrality. The CLS critique, as articulated mainly by Singer, will be described briefly below.

A. *Determinacy*

Determinacy, when used by Singer and other CRITs, refers to the idea that laws determine the outcome of conflicts.[18] A legal rule is deterministic if it "tells us what to do"; in the extreme, complete determinacy leaves us no choice at all.[19] Indeterminacy, on the other hand, allows choice in the outcome of conflicts. Singer claims that laws are far more indeterminate than traditional legal theorists ("liberals" in CRIT terminology) claim.[20] Traditional judges, therefore, can claim determinacy, but use legal reasoning to justify a desired outcome. In effect, the judge is saying, "I can't help it, the law dictates what

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[13] For a complete discussion of the new epistemology and the role of CLS, see *id.*

[14] *See* Chow, *supra* note 6, at 223; Ewald, *Unger's Philosophy: A Critical Legal Study*, 97 YALE L.J. 665, 668 (1988); Minda, *supra* note 2, at 615.

[15] *See* Minda, *supra* note 2, at 615–18; Minnow, *supra* note 5, at 83.

[16] Singer, *supra* note 11, at 9.

[17] Chow, *supra* note 6, at 227; Ewald, *supra* note 14, at 669.

[18] The ideas for the next section are taken to a large extent from a paper by Joseph Singer. *See generally* Singer, *supra* note 11. *See also* Williams, *supra* note 6, for discussions of the new epistemology, and its influence on legal realism and CLS.

[19] Singer, *supra* note 11, at 11.

[20] *Id.* at 14.

the outcome will be." In fact, the judge is making a decision based on his own view of a just outcome.[21]

Singer does not assert that "liberal" scholars claim complete determinacy; only that "liberals" claim choices are severely constrained.[22] Traditional legal theory, in Singer's view, incorporates both determinacy and indeterminacy with a large amount of determinacy as a premise for the rule of law.[23] The CLS critique of the traditional theory is that, in fact, law is extremely indeterminate: "If traditional legal theorists are correct about the importance of determinacy to the rule of law, then—by their own criteria—the rule of law has never existed anywhere."[24]

The process used by CRITs to challenge "liberal" theorists is called "internal critique" or "trashing."[25] CLS claims to criticize traditionalists from within by using the premise of traditional theory against itself.[26] For instance, Joseph Singer uses internal critique to point out that legal doctrine is not deterministic.[27] He does this by asserting that a legal theory must be comprehensive, consistent, directive, and self-revising in order to be fully deterministic. Because each of these qualities is not fully realized in traditional legal theory, traditional legal theory is therefore not deterministic.[28]

CRITs believe that law is directed not by deterministic rules, but entirely by politics.[29] The legal reasoning and theories used by judges are, in fact, only justifications for decisions based on the judges' political views or cultural surroundings.[30]

B. *Objectivity*

Objectivity is the assertion that the truth or falsity of a moral, political, or legal view can be demonstrated by rational argument.[31] Singer and other CRITs reject this idea because they feel that moral, political, and legal views are not based on rational argument, but on personal experience and emotion.[32]

Singer thus attacks not only the determinacy of legal rules, but the foundation or legitimacy of the rules. The traditional theories of positivism and natural law are based on an outside "source" for the law. In positivism, it is the

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[21] *Id.*
[22] *Id.* at 13-14.
[23] *Id.* at 14.
[24] *Id.*
[25] *Id.* at 10; Chow, *supra* note 6, at 227.
[26] Singer, *supra* note 11, at 10.
[27] *Id.* at 14–25.
[28] *Id.*
[29] *Id.* at 22–25.
[30] *Id.*
[31] *Id.* at 25.
[32] *Id.* at 25–39.

sovereign that is the source of all law. Natural law is based on a transcendent source for the law, such as nature or God.[33] Singer rejects the view that legal rules are legitimate if they accurately represent some external source.[34] Because the foundation for most traditional legal thought cannot be described with sufficient accuracy to provide an objective basis for moral or political conviction, it cannot tell us what to do.[35] Singer contends that moral, political, and legal views are not a matter of rational or objective reasoning leading to a demonstrable truth. Instead, they are the result of individual experience and emotion which leads to moral conviction.[36]

C. *Neutrality*

Singer attacks the idea that one of the important goals of the law should be neutrality.[37] According to CLS, neutrality is the traditional view that individuals should be allowed their own concept of freedom and the good life, and that limits to this freedom should be based on principles of justice that are independent of judges' own visions of these ideals.[38] Singer maintains that this view is itself nonneutral and political because it is opposed to views that do not recognize individuality.[39]

A central theme of CLS is to reveal how traditional legal analysis and doctrine do not serve to promote justice, equality, and the good life. Instead, traditional analysis justifies the status quo and gives legitimacy to hierarchies of race, gender, and class.[40] Supposedly neutral legal principles actually legitimize those in power instead of creating a truly democratic society. In order to uncover the hidden assumptions of traditional legal analysis, some CRITs describe traditional doctrines in terms of a "narrative" or "story."[41] The narrative is said to reflect underlying ideological and political bias. "For example, women and racial minorities within CLS have shown how law can be understood as a political discourse of power contextualized within a social and legal description established by white male discourse."[42] In the CRITs' view, those in power claim that the law is neutral, so that when the law continues to

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[33] *Id.* at 27.
[34] *Id.* at 29.
[35] *Id.* at 30–38.
[36] *Id.* at 38–39.
[37] *Id.* at 40–47.
[38] *Id.* at 40.
[39] *Id.* at 41.
[40] Minda, *supra* note 2, at 617.
[41] *Id.* at 616. Although Singer does not discuss narrative in his paper, it is an important part of the CLS critique of neutrality and is therefore included here.
[42] *Id.* at 617.

reinforce their position of dominance, legitimacy for that position can be asserted.

D. *Destinations*

One of the most common criticisms of CLS is that CRITs suggest no clear alternative to the rule of law.[43] CRITs are divided on what to do about the law after demonstrating its illegitimacy. Some, known as "rationalists" or "northerners," attempt to reconstruct legal doctrine and provide a new rational basis for law.[44] The "irrationalists" or "southerners" argue that reconstruction is futile because all attempts to provide a normative basis for law are subject to the same critiques as "liberal" legal doctrine.[45] Irrationalists such as Joseph Singer would, therefore, completely give up legal reasoning as a basis for deciding what to do about human conflict.[46] He contends that difficult moral decisions should be made, not by rational formulae, but by having "conversations" and engaging in the "joint reconstruction of social life."[47] Decisionmakers, according to Singer, should examine society's values and make choices based on the likely consequences of various alternatives.[48] His social vision is to "prevent cruelty," "alleviate misery," and "alter social conditions that cause loneliness."[49]

III. THE PHILOSOPHICAL BACKGROUND FOR CLS

Joan Williams has suggested that CLS has its philosophical roots in the "new epistemology" of the twentieth century.[50] The new epistemology, according to Williams, can be traced to the revolution in mathematics and physics in the latter part of the nineteenth century and early part of the twentieth century.[51] The revolution in physics had a profound effect on a large number of fields, including literary criticism, philosophy, linguistics, the visual arts, and now law.[52]

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[43] *See, e.g.*, Johnson, *Do You Sincerely Want to Be Radical?*, 36 STAN. L. REV. 247, 260 (1984) ("Critical legal writing systematically evades the question, 'Compared to what?'"), *cited in* Minda, *supra* note 2, at 615.

[44] Minda, *supra* note 2, at 619–20.

[45] *Id.* at 620.

[46] Singer, *supra* note 11, at 57.

[47] *See generally* Frug, *The Ideology of Bureaucracy in American Law*, 97 HARV. L. REV. 1276, 1386 (1984); Singer, *supra* note 11, at 66.

[48] Singer, *supra* note 11, at 65–66.

[49] *Id.* at 66–70.

[50] Williams, *supra* note 6, at 431.

[51] *Id.* at 436–39.

[52] *Id.* at 436–91.

This section will briefly outline the development of the new epistemology from its scientific roots through its philosophic and linguistic effects to its influence on the law.[53] The emphasis will be on the scientific revolution itself.

A. *The Scientific Background*

Until the latter part of the nineteenth century, the discoveries of science, and particularly physics, were thought to correspond to a transcendental and purely objective reality.[54] The ideas of Newton described the motion of solid bodies with precision and predictability. The Marquis de Laplace went so far as to suggest that a set of scientific laws could be discovered that would allow prediction of everything in the universe.[55] Determinism was the standard assumption of science until the turn of the century.

A number of important developments in physics occurred around the turn of the century that challenged the concept of determinism. These developments were the basis for a revolution in physics that captured the imagination not only of scientists, but of society at large. Three major lines of work make up the revolution: The structure of the atom, Einsteinian relativity, and quantum mechanics. Each of these is discussed below.

1. *The Structure of the Atom*

Philosophers and scientists have argued about the fundamental nature of matter since the time of Aristotle.[56] Aristotle believed that matter was inherently homogenous; matter could be divided into smaller and smaller pieces without limit. Another Greek, Democritus, thought that matter was grainy, and that at a certain point matter could no longer be divided without changing its inherent nature.[57] Democritus called the indivisible piece or building block of matter the atom. Some evidence was presented in the nineteenth century that matter was indeed made of different types of particles, but it was not until the early twentieth century that the argument was finally settled.[58] The work of a number of scientists showed that matter was made of particles, and that these particles had internal structure.

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[53] The reader is directed to Williams' comprehensive review of the subject for more detail. *See generally id.* at 436-69.

[54] *Id.* at 436.

[55] S. HAWKING, *supra* note 7, at 53.

[56] *Id.* at 64. *See also* Heisenberg, *Planck's Discovery and the Philosophical Problems in Nuclear Physics*, in SCIENCE AND SOCIETY 108 (Valvoulis & Colver ed. 1966).

[57] Heisenberg, *supra* note 56, at 108.

[58] S. HAWKING, *supra* note 7, at 64.

In 1911, by colliding alpha-particles with matter, Ernest Rutherford demonstrated that atoms have internal structure.[59] The inner part of the atom forms a positively charged nucleus, and negatively charged electrons form an outer part. Electrons were first thought to "orbit" the nucleus as planets orbit the sun. The problem with this model is that electrons would spiral into the nucleus, causing all matter to collapse rapidly.[60] In 1913, Niels Bohr suggested that the electrons could be found only at certain distances from the nucleus, known as "orbitals." Each orbital corresponds to a particular energy level. Only one or two electrons can occupy any one orbital, and thus an electron can collapse toward the nucleus only until it fills one of the lower energy orbitals.[61] More recently, scientists have discovered that the protons and neutrons, which make up the nucleus, are themselves not fundamental, but are made of smaller particles called quarks.[62] One of the important implications of these discoveries (together with those of quantum mechanics) is that the nature of matter depends on the scale at which one studies it. That is, matter behaves one way on the macroscopic level, and another on a sub-microscopic level.[63]

2. *Relativity*

The Aristotelian concept of the behavior of physical bodies was that they had a state of preferred or absolute rest.[64] Galileo and Newton showed that there is no absolute standard of rest. One cannot tell if object A is at rest and object B is moving, or if object B is at rest and object A is moving.[65] In the Newtonian universe, therefore, movement of any object had to be measured relative to some other object. In both the Aristotelian and Newtonian worlds, however, time was absolute.[66]

In the 1860s, James Clerk Maxwell succeeded in developing a theory for the propagation of light and other electromagnetic radiation.[67] This theory predicted that light should travel at a fixed speed, but Newton's laws required that speed be measured relative to something. It was suggested that there existed an "ether" through which light waves travel, just as sound waves travel through air.[68] Observers would measure the speed of light differently

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59 *Id.*; J. BRONOWSKI, *supra* note 1, at 334.

60 J. BRONOWSKI, *supra* note 1, at 334; S. HAWKING, *supra* note 7, at 59.

61 J. BRONOWSKI, *supra* note 1, at 336; S. HAWKING, *supra* note 7, at 59.

62 F. CAPRA, THE TAO OF PHYSICS 242–43 (2d ed. 1984); S. HAWKING, *supra* note 7, at 65.

63 *See infra* notes 125–32 and accompanying text.

64 S. HAWKING, *supra* note 7, at 15.

65 *Id.* at 17.

66 *Id.* at 18.

67 *Id.* at 19.

68 *Id.*

depending on their position and speed relative to the light, but the light would always travel at a constant speed relative to the ether.

In 1887, the famous Michelson-Morley experiment contradicted the idea of an ether through which electromagnetic waves move. The experiment showed that the speed of light was the same no matter what the position and speed of the observer.[69] In 1905, Albert Einstein and Henri Poincare suggested a solution to the problems raised by the Michelson-Morley experiment. They asserted that if the idea of absolute time is abandoned, there is no need for the concept of an ether.

The theory of relativity proposes that the laws of science are the same for all freely moving observers. All observers measure the same speed of light, no matter how fast the observer is moving.[70] This revolutionized ideas of space and time. Because the speed of light is the same for all observers, time and distance must be relative. Observers moving at different velocities relative to an event measure different times passing for the same event. This effect is not "just in the minds" of the observers; identical clocks carried by two observers record different amounts of time passing.[71] Sometimes this phenomenon is called the "paradox of the watch" or the "twin paradox." If one of a set of identical twins goes on a journey at high speed, he will return younger than his brother. In addition, his watch will have recorded less time than his brother's.[72]

3. *Quantum Mechanics*

In 1900, Max Planck found that electromagnetic radiation is emitted as quanta, or finite packets of energy, rather than as a smooth continuum of energy predicted by the wave model.[73] This was the first modern indication that electromagnetic energy could be thought of as particles, rather than waves. The implications of Planck's quantum theory of light were not completely understood until Werner Heisenberg developed the uncertainty principle in 1926.[74] The uncertainty principle has to do with measurement of the position and velocity of a sub-atomic particle. Measuring such a particle requires shining light on it and measuring the scatter of the light as it hits the particle. Because the particle is small, a very short wavelength of light must be used to measure it. A long wavelength cannot be used, because the distance between

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[69] J. BRONOWSKI, *supra* note 1, at 247; S. HAWKING, *supra* note 7, at 20.

[70] J. BRONOWSKI, *supra* note 1, at 248; S. HAWKING, *supra* note 7, at 20.

[71] For an excellent explanation of Einstein's remarkably simple illustrations of this phenomenon, see J. BRONOWSKI, *supra* note 1, at 247-52. *See also* S. HAWKING, *supra* note 7, at 20-21.

[72] Heisenberg, *supra* note 56, at 109; J. BRONOWSKI, *supra* note 1, at 255.

[73] J. BRONOWSKI, *supra* note 1, at 336; S. HAWKING, *supra* note 7, at 54.

[74] J. BRONOWSKI, *supra* note 1, at 364-65; S. HAWKING, *supra* note 7, at 54.

the trough and crest of the wave becomes larger than the size of the particle. The light would "miss" the particle—not hit it at all. However, the shorter the wavelength of light, the higher the energy a single quantum of light must have. Because the particle must be hit with at least one quantum and that quantum is high energy, it will interact with the particle and alter its velocity. The more accurately the position of the particle is measured, the less accurately its velocity can be determined and *vice-versa*. There is a finite limit at which this uncertainty exists, and it is a fundamental property of the universe. The particle cannot be measured with more accuracy than this limit allows.[75]

An important consequence of the uncertainty principle is the inability to describe sub-atomic particles using conventional Newtonian language. Rather than positions and velocities, sub-atomic particles are now said to have "quantum states."[76] Quantum mechanics is the theory developed by Heisenberg, Schrödinger, and Dirac to explain the quantum states of particles. Quantum mechanics requires a reconciliation between waves and particles; sometimes it is helpful to think of particles as waves, and sometimes it is helpful to think of waves as particles. In addition, rather than predicting a single, deterministic outcome for any event involving particles, quantum mechanics predicts a number of possible results. It is impossible to tell whether any particular particle will end in any given outcome, but it is possible to say how many out of a number of particles will end in a particular outcome.[77]

B. *Philosophical Assimilation*

The philosophical movement known as logical positivism resulted from a rejection of the old, transcendental way of thinking, based at least in part on the findings of physics in the early twentieth century.[78] Logical positivism is identified by Williams as the "first wave" of the new epistemology. Theories, according to the logical positivists, do not describe any kind of objective reality without experimentally verified facts.[79]

The assimilation of this first-wave epistemology in the law was legal realism.[80] Legal realists reject the classical idea of judicial decisionmaking: that judges apply doctrine in an abstract, "scientific" way and logically deduce the correct answer. Instead, legal realists assert that legal doctrine, like scientific theory, is not representative of reality. Only a study of what a judge actually

[75] S. HAWKING, *supra* note 7, at 54–55 (Hawking's explanation of the uncertainty principle).

[76] *Id.* at 55.

[77] *Id.* Einstein was uncomfortable with this idea, *see, e.g., supra* note 1.

[78] Williams, *supra* note 6, at 439–40.

[79] *Id.* at 440 (quoting E. PURCELL, THE CRISIS OF DEMOCRACY 48 (1973)).

[80] *Id.* at 442.

does is relevant to understanding the legal system.[81] Similarly, legal realists advocate study of the actual, practical effects of law on people, rather than study of legal theories.[82]

Based in part on relativity theory and the Heisenberg uncertainty principle, a "second wave" of the new epistemology questioned not only the transcendental aspects of theories, but also the facts themselves.[83] Second-wave thinkers took relativity to stand for the idea that the "facts" of an event depend entirely on the observer's point of view. Similarly, the uncertainty principle has been translated into a popular notion that by the very act of observing, the object or event observed is altered. Therefore, second-wave thinkers believe that discovery of any "true" facts becomes impossible. The facts themselves are an artifact of the observer's point of view.[84]

These ideas have had profound effects on Western intellectual thought in the twentieth century.[85] In particular, linguists have pointed out that human perceptions are filtered through the language and culture of the particular person involved.[86] The Platonic idea of "ideal forms,"[87] which had resulted in a "picture theory" for language, is rejected by modern linguists.[88] Categories of language thought to correspond to universal concepts were shown to be artifacts of Western thought not shared by other cultures. These ideas are bolstered by the physicists' assertions that ordinary language is inadequate to the task of describing sub-atomic phenomena. Modern linguists assert, in turn, that human beings have no access to objective facts.[89] According to Williams, CLS is the response in legal studies to the second wave of the new epistemology.[90]

IV. COMPARISONS

"At the center of the CLS universe is a straw man: the liberal committed to the picture theory who is oblivious to physics since Einstein and to philosophy since Kant, and who believes that law when objectively applied by a neutral judge, gives correct answers in specific cases."[91]

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81 *Id.* at 443.

82 An example of this is law and social science; *see, e.g.*, Schlegel, *American Legal Realism and Empirical Social Science: From the Yale Experience*, 28 BUFFALO L. REV. 459 (1979).

83 Williams, *supra* note 6, at 445.

84 *Id.*

85 *Id.* at 445-69.

86 *Id.*

87 Heisenberg, *supra* note 56, at 108.

88 Williams, *supra* note 6, at 446.

89 *Id.* at 447.

90 *Id.* at 430.

91 *Id.* at 485–86.

Nihilist CRITs, such as Joseph Singer, maintain that legal process is essentially illegitimate because it is impossible to ground the legal system in a rational foundation.[92] If CLS is indeed the product of an epistemology based on the scientific revolution of the early twentieth century, it follows that relativity and quantum mechanics should have rendered the process of science illegitimate, and any attempt to ground science on a rational basis futile. Rather than abandoning rationality, however, physics as well as other branches of science have flourished since the early twentieth century.

Why is this so? Are scientists poor deluded "liberals" who persist in continuing a project that is essentially doomed? Do physicists themselves not understand the true impact of their own discoveries and refuse to believe, for instance, the uncertainty principle? The answer must be no. After all, physicists explained relativity and quantum mechanics to the rest of us; it is inconceivable that they do not understand the implications of their own theories. Science in the modern age must remain useful in some way, or scientists would not pursue it. Is it possible that the legal process also remains useful after CLS?

The purpose of this section is to compare CLS and the new epistemology directly with science itself. It is not suggested that a perfect analogy exists between science and the law. Instead, the scientific findings are explored to show that CLS, and new epistemology in general, is inconsistent with its philosophical roots in early twentieth-century physics. In addition, the scientific findings are useful in exploring some aspects of the law, even though a strict analogy does not exist. The comparison will be done in three stages. First, the actual findings and implications of the revolution in physics will be compared with counterparts found in the new epistemology. Second, three aspects of modern science that are often overlooked by the new epistemology will be discussed. These are characterized as scale, tolerance, and process. Finally, legal process and CLS will be discussed in light of the findings of twentieth-century physics.

A. *The Science Itself*

1. *Quantum Mechanics and the Uncertainty Principle*

Several ideas of quantum mechanics have fired the imaginations of philosophers and others outside of science.[93] Two aspects of quantum theory are particularly important to the understanding of the new epistemology.[94] Quantum theory redefines sub-atomic matter. Sub-atomic matter is no longer thought of strictly as particles, but sometimes as particles and sometimes as

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[92] *See supra* notes 31–36 and accompanying text.

[93] Williams, *supra* note 6, at 438–39.

[94] *Id.*

waves.[95] The change is required because neither the behavior of macroscopic bodies, nor the behavior of waves can adequately explain the behavior of sub-atomic matter. This is sometimes characterized by second-wave thinkers as a "failure" of the wave and particle paradigms, as well as the inability of everyday language to describe an objective reality.[96]

The wave/particle duality is, in fact, not a limitation on the understanding of sub-atomic particles by modern physics. Instead, it is a way of describing newly discovered phenomena in ordinary language. Quantum mechanics is based on a new type of mathematics which does *not* describe the world in terms of particles or waves.[97] When observing and describing sub-atomic phenomena, in some cases it is helpful to think in terms of waves, and in other cases of particles. Scientists refer to this as the wave/particle duality, but it is only a limitation of ordinary language that requires such a label. In fact, according to quantum mechanics, sub-atomic matter is neither waves nor particles; it has attributes of both.[98]

The mathematics developed for the wave/particle nature of matter explains many of the phenomena of sub-atomic matter. Far from a failure, quantum theory is "outstandingly successful" and is the basis of much of modern science and technology.[99] It is difficult to explain the ideas of quantum theory in everyday language, because the phenomena are not within everyday experience. Therefore, the wave/particle duality is difficult to describe, not because of the cultural bias of language,[100] but because the phenomena are unknown in daily experience. Everyday words to describe sub-atomic phenomena are not available in any language. Thus, modern linguistics theories, interesting as they are, do not "make accessible to intellectuals"[101] the insights of modern physics.

The uncertainty principle is the second aspect of quantum theory to influence the new epistemology.[102] The uncertainty principle has been popularized into a notion that nothing can be observed or measured without altering the phenomenon being observed.[103] In addition, the uncertainty principle is said to have done away with predictability.[104]

The uncertainty principle, like quantum theory, was developed to explain a specific phenomenon associated with physical matter. As Stephen Hawking

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[95] *See supra* notes 73–77 and accompanying text. *See also id.*

[96] *Id.*

[97] S. HAWKING, *supra* note 7, at 56.

[98] *Id.*

[99] *Id.*

[100] Williams, *supra* note 6, at 446. *See also supra* notes 86–89 and accompanying text.

[101] Williams, *supra* note 6, at 447.

[102] *Id.* at 438.

[103] *Id.* at 438–39.

[104] *Id.* at 437–38.

said, the uncertainty principle is "a fundamental, inescapable property of the world."[105] It is not, however, a universal rule that can be applied to any phenomenon. The uncertainty principle was developed specifically to explain phenomena on the sub-atomic scale. Observations made at other scales may or may not need to take account of a similar principle.[106]

One consequence of the uncertainty principle and quantum mechanics is the breakdown of Newtonian determinism.[107] The Laplacian dream of being able to predict exactly all future events is destroyed by quantum mechanics, because quantum mechanics does not predict a single definite result for a given observation.[108] A number of outcomes are possible for any system.[109] Once again, it is tempting for second-wave thinkers to translate this into a nonscientific notion that nothing is predictable. Rational, scientific principles, it might be said, once again have "failed" to provide a predictable universe.

In fact, although quantum theory cannot predict the outcome of a single observation, it can and does tell accurately how likely a given outcome is.[110] If a large number of observations are made on systems that start out the same way, one can predict the approximate number of times the result will be A, the number of times B, and so on.[111] There is thus an unavoidable element of chance in an individual event, but the overall pattern of events can be predicted with great accuracy. Newton's completely deterministic universe is gone, at least on the sub-atomic level, but it is not accurate to assume the demise of all predictability based on rational thought.

Statistical uncertainty had been known long before quantum mechanics. In the late 1700s, Karl Friederich Gauss investigated uncertainty in the context of astronomical observations.[112] When an astronomer is studying a star, it is necessary to take several readings of every observation. No matter how precise the instruments, and how careful the measurement, there is always a scatter in the data.[113] Gauss took these data and showed that they fall on a bell-shaped curve. Most scientists simply assume that the "correct" reading is the average—the center of the curve. Gauss went on to postulate that the scatter itself tells us that there is an inevitable area of uncertainty for any observation.[114] The uncertainty of any one observation can be calculated by the

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105 S. HAWKING, *supra* note 7, at 55.

106 *See infra* notes 124–33 and accompanying text for a discussion of scale.

107 S. HAWKING, *supra* note 7, at 55.

108 *Id.*

109 *Id.*

110 *Id.* at 55–56.

111 *Id.* at 56.

112 J. BRONOWSKI, *supra* note 1, at 358.

113 *Id.*

114 *Id.*

scatter of all similar observations. Thus, the idea of uncertainty in scientific observation is not new to twentieth-century physics.[115]

2. *Relativity*

Another aspect of modern physics that has gained attention from nonscientists is Einsteinian relativity.[116] Einstein postulated that space and time are not absolute and separate, but form a four-dimensional continuum.[117] The observation of any event depends entirely on the perspective of the observer.[118] Different observers might order events differently if they move with different velocities relative to the events. Therefore, rather than a firm foundation of absolute space and time, one might now see the world as bottomless, with no absolutes.[119] This lends credence to an idea of moral or cultural relativism.

What is overlooked by nonscientists is that a type of relativity was known to Newtonian physicists. It follows directly from Newton's laws that there is no absolute standard of rest.[120] This means that in the Newtonian universe, an event could not be given an absolute position in space.[121] It was because of the relativity arising from Newton's laws, together with equations developed by James Clerk Maxwell, that the idea of an ether was proposed.[122] This led directly to the Michelson-Morley experiment which prompted Einstein to postulate that there is no absolute time.[123]

However, even though Einsteinian relativity does away with the idea of absolute time, it does not result in a universe without absolutes. The speed of light, which had been thought of as relative, is now an absolute. Therefore, it is inaccurate to think of the Einsteinian universe as completely relativistic; instead what we hold absolute has changed.

B. *Scientific Principles*

Several aspects of modern science are often overlooked by second-wave thinkers and other nonscientists. These concepts bear directly on an

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[115] *Id.*

[116] Williams, *supra* note 6, at 437.

[117] *Id.* at 437; S. HAWKING, *supra* note 7, at 23.

[118] J. BRONOWSKI, *supra* note 1, at 249.

[119] Williams, *supra* note 6, at 438.

[120] S. HAWKING, *supra* note 7, at 17–18. *See also supra* note 65 and accompanying text.

[121] *Id.* at 18.

[122] *Id.* at 19. *See also supra* note 68 and accompanying text.

[123] *See also infra* notes 124–27 and accompanying text for a discussion of scale and relativity.

understanding of physics and its influence on the new epistemology. Three factors will be discussed below: Scale, tolerance, and process.

1. *Scale*

The idea of scale might best be illustrated by a story. A professor of physics comes out of his office at MIT, gets into his car and prepares to drive home. This particular professor is a world expert in quantum mechanics. In fact, at the time he comes out of his office on this particular day he understands the concepts of modern physics better than any man or woman on Earth. The indeterminacy of electrons, the uncertainty principle, and the charm of quarks are second nature to him.

The central question is this: How does the professor drive his car? Does the car have "quantum states" by which either its velocity or its position, but not both, can be determined? When a highway patrolman uses a radar detector and bounces a radio wave off the back of the car, will this measurement irrevocably alter the car and render the measurement of velocity meaningless?

Of course, the answer is no. Cars behave according to Newton's laws,[124] and the professor will be well advised to act accordingly. How can this be? Modern physics is supposed to have knocked the foundation out from under Newton forever. Why is it that we are bound by Newtonian laws in everyday life?

We are bound by Newton's laws because of scale. On the sub-microscopic level, the atoms making up the car behave according to the principles of modern physics. A beam of light (or radio waves) aimed at any particular sub-atomic particle in the car would indeed alter it. The electrons in the atoms making up the car have quantum states. These effects are real and measurable in a physics lab, but are so small at the macroscopic level that they are negligible when considering the interactions of objects such as cars. Even though the world-view of the scientist might be changed forever by modern physics, he is forced to behave in everyday life just as he did before.

To carry the analogy to relativity, one might ask how the policeman observes the professor's car. After all, the measurement of velocity of any object depends on that object's position in space-time and the position of the observer in space-time. What appear to be simultaneous events to one observer

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[124] To say that cars obey Newton's laws is not strictly correct. In fact, Newton's equations and those of quantum mechanics describe with equal accuracy the behavior of macroscopic bodies. Because quantum mechanics can account for both the behavior of macroscopic bodies and sub-atomic phenomena, it is considered to be the "correct" theory. However, because the equations involved in quantum theory are complex, macroscopic phenomena are said to obey Newton's laws. The idea that phenomena are different depending on size is a direct outgrowth of quantum mechanics. *See infra* note 130 and accompanying quote.

may appear to occur at different times to another.[125] More importantly, relativity tells us that the size of an object varies with its velocity relative to an observer, and the passage of time varies with an object's velocity relative to an observer.[126] This is the source of the famous "twin paradox."[127]

Why does the policeman insist on trying to measure the velocity of the professor's car in the face of these daunting facts? Why doesn't the professor argue relativity when faced with a speeding ticket? The answer once again is scale. Indeed, the size and time of the car vary with its velocity relative to the policeman.[128] In order for this effect to become significant, however, the speed of the moving object must be close to that of the speed of light.[129] Because even the most reckless physics professor drives nowhere near 186,000 miles per second, the relativistic effects are negligible.

Werner Heisenberg recognized the importance of scale in modern physics:

> Planck's action quantum, which appears as the characteristic constant in his law of radiation, does not designate a property of things but a property of nature. It sets up a scale of measurement and shows that where the encountered effects are very big . . . [they] behave differently from the way they do where they are of atomic size the realm of the Planck constant. Whereas the laws of Newtonian mechanics were equally valid for all realms of magnitude—the orbit of the moon around the earth obeying the same laws as the fall of an apple or the deviation of an alpha particle passing by the nucleus of an atom—Planck's radiation law for the first time postulated the existence of different scales in nature and suggested that events in the different realms of magnitude need not be similar at all.[130]

Thus, modern physics itself introduced the idea that events at different magnitudes need not be similar. Newtonian physics is still taught at universities because it forms the basis for understanding modern physics and still explains physical phenomena on a macroscopic scale.[131]

2. *Tolerance*

The word tolerance is offered as an alternative to uncertainty. The idea is not original here; Jacob Bronowski proposed it in his book *The Ascent of*

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[125] Williams, *supra* note 6, at 438.

[126] J. BRONOWSKI, *supra* note 1, at 249; S. HAWKING, *supra* note 7, at 20–21.

[127] If one of a set of twins goes on a trip while his brother stays home, the traveller will return younger than his brother. From the stay-at-home's point of view, time for the traveller passed much more slowly. *See supra* note 72 and accompanying text.

[128] S. HAWKING, *supra* note 7, at 20–21.

[129] *Id.*

[130] Heisenberg, *supra* note 56, at 109.

[131] *See infra* note 143 and accompanying text.

Man.[132] The uncertainty principle by its very name suggests unpredictability. In fact, the uncertainty principle does not stand for complete unpredictability. Rather, the principle as formulated by Heisenberg is very precise: the uncertainty in the position of a particle multiplied by the mass of the particle must be larger than a quantity known as Planck's constant.[133] That is, the speed and position of the particle fit together and are confined within a certain tolerance.[134] This idea can be understood on an everyday level; an object need not be exactly the same for us to recognize it at different times.[135] To use Bronowski's example, the face of a good friend may look different each time we see it—if it is still "tolerably like," then it is recognizable.[136] An amount of uncertainty is built into every observation. That uncertainty, however, is not infinite or even large in comparison with the object or event as a whole. Observations are uncertain within some tolerance, but the tolerance need not overwhelm the observation.[137]

The idea of tolerance and uncertainty is not new with Heisenberg; Gauss studied the phenomenon in the 1700s.[138] What Heisenberg did was to illustrate that there is uncertainty at the atomic level, and to quantify the tolerance. In a sense, uncertainty became more predictable, not less. "In science or outside it, we are not uncertain; our knowledge is merely confined within a certain tolerance. . . . Science has progressed step by step . . . because it has understood that the exchange of information between man and nature, and man and man, can only take place with a certain tolerance."[139] In sum, the uncertainty principle does not render all observable facts meaningless because they are hopelessly uncertain. Rather, it provides a way to specify the tolerance within which one must make any observation.

3. *Process*

One feature of science has not changed since before the early twentieth century, even for physicists and astronomers. This is the process by which science is actually done—the scientific method.[140] The ongoing and interactive nature of the scientific method is an important factor in understanding science.

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[132] *See supra* note 1.

[133] S. HAWKING, *supra* note 7, at 55.

[134] J. BRONOWSKI, *supra* note 1, at 365.

[135] *Id.*

[136] *Id.*

[137] *Id.*

[138] *See supra* notes 114–15 and accompanying text.

[139] J. BRONOWSKI, *supra* note 1, at 365.

[140] S. HAWKING, *supra* note 7, at 9-13. *See also* Powell, *The Earth's Age and the Evolution-Creativity Controversy*, 1983 OBERLIN ALUMNI MAG. Autumn 1983, at 19 (explanation of the method as applied to the age of the earth and biological evolution).

An idea, called an hypothesis, is formed to explain a phenomenon of nature. One or more hypotheses are then tested by observation and experiment, and altered to accommodate the new information.[141] The altered ideas are then tested, and altered again. This process can go on for years, decades, even centuries. Only after considerable testing is an hypothesis characterized as a theory. Even then, new observations possible because of advances in technology or ingenious thinking, can partly or wholly discredit a prevailing theory. Each time a new hypothesis is formed, the scientist's mental picture of that particular phenomenon is changed. Usually the change is small. Occasionally the change is enormous, and revolutionizes the way scientists perceive certain phenomena.[142] Thus Einstein's ideas were not a replacement of classical physics, but were a refinement, albeit a large one, of Newton's ideas. As Werner Heisenberg said, "the notions of classical physics provide an a priori foundation for the investigations of quantum physics, since we can carry out experiments in the atomic field only with the aid of concepts from classical physics."[143] Thus even though the conclusions of modern physics may be radically different from those of classical physics, the process by which physics is done, the scientific method, is essentially the same.

C. *Physics and Legal Theory*

> "Stop telling God what to do."
>
> —Niels Bohr[144]

Science is the process by which man explores the universe. Law, on the other hand, is the process by which man governs himself and involves the distribution of power and human rights. Society, at least on some level, can control the process and the results of law, but not the results of science. For these reasons, no strict analogy between science and law is possible. This section, however, proposes that some concepts from science can be used to explain aspects of the law in a new way. The process of science has not been stopped or discredited by the discovery that the laws of science are not absolute. The thesis of this section is that the law need not be discredited nor stopped by the discovery that the rule of law is not absolute.

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141 For the classic paper on multiple working hypotheses in science, and a description of the use of hypotheses in general, see Chamberlin, *The Method of Multiple Working Hypotheses*, 148 SCIENCE 754 (1965), *reprinted from* 15 SCIENCE (old series) 92 (1890).

142 *See generally* T. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (2d ed. 1970).

143 Heisenberg, *supra* note 56, at 111.

144 J. BRONOWSKI, *supra* note 1, at 256. This is Bohr's retort to Einstein's famous quote; *see supra* note 1 and accompanying quote.

1. *Determinacy*

a. *Tolerance*

We have seen that indeterminacy in science does not imply complete unpredictability. Instead, natural phenomena are predictable within a certain tolerance. The irrationalist CRITs, such as Singer, charge that determinacy is central to traditional legal thought, but that in fact laws are largely indeterminate. This section proposes a middle ground for the law that incorporates a principle of tolerance similar to that in science.

Singer mentions the idea that legal rules may narrow choice within boundaries, but not tell us what to do inside the boundaries. He contends that within such boundaries, law is nondirective.[145] This is very similar to an idea of a tolerance within the law. Singer and all legal theorists concentrate on the areas of ambiguity "inside the boundaries," because those areas lead to the appellate opinions that form the basis of most legal literature. The vast majority of laws, as they affect our everyday lives, are not nearly as ambiguous. This part of the law is virtually ignored by most legal theorists, including CRITs. The law seems indeterminate to CRITs because of concentration by judges and legal theorists on areas of ambiguity.

A concept of tolerance within the law can take several forms. Some tolerance is built in—uncertainty that cannot be eliminated. This involves limits set by the physical world on the operation of law. Other tolerances are built deliberately into the system. This includes areas of discretion that judges or legislatures purposely insert into the operation of law. Finally, although uncertainty within a certain tolerance in the law cannot give us a definitive answer for a given case, it may allow us to predict the likelihood of a given outcome over a large number of cases.

Some areas of the law are not uncertain, although not completely determinate. For instance, citizens are aware in general of what is legal and what is not in their everyday experience. Running a red light is illegal; stopping for a red light is not. Even traffic laws, however, are not strictly determinate—some tolerance exists. For instance, if a car pulls into an intersection just as the light turns red, is that illegal? Exactly when does it become illegal? This is when a certain tolerance comes in; the motorist (and the police officer who is watching) must use some judgment in deciding whether it is illegal.

Even though there is some judgment in every legal issue, it may be impossible to predict exactly what the tolerance is or how big it is. The police officer may give some motorists more tolerance than others, and different police officers may have different boundaries for the tolerance. Race, gender,

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[145] Singer, *supra* note 11, at 19.

or other political bias may play a role in the decision. The tolerance can be widened and narrowed to some extent, but not done away with altogether. This is because of the way the world outside of law works. It is simply impossible for human beings to set up a system that is absolutely accurate about when a motorist runs a red light and when he does not.

In most cases, however, the motorist knows to stop for the red light. It is only when he is "close to the edge" that we are in the area of tolerance, and the law has a high potential for political outcomes. In fact, citizens know quite well in general when they are following the law and when they are not. People are also aware of the tolerance allowed them in many situations. Most drivers know approximately how much above the speed limit they can go before the highway patrol will stop them; this is the tolerance given by the authorities to take into account inaccuracies in the speed testing equipment and in motorists' speedometers.

Although some tolerance is caused by unpredictable application of laws, some tolerance is deliberately built into rules that could otherwise be more determinate. The ambiguity caused by this type of tolerance is not only known to "liberals," but is openly acknowledged. It is well known that the discretion given judges and juries results in some decisions that are racially or politically based. The advantages of flexibility are often considered to outweigh the disadvantages of indeterminacy. An example of this type of tolerance is embodied in Justice Powell's opinion in *McCleskey v. Kemp* regarding racial bias in the application of capital punishment:

> There is, of course, some risk of racial prejudice influencing a jury's decision in a criminal case . . . . The question "is at what point that risk becomes constitutionally unacceptable[.]"
>
> McCleskey's argument that the Constitution condemns the discretion allowed decisionmakers in the Georgia capital sentencing system is antithetical to the fundamental role of discretion in our criminal justice system. Discretion in the criminal justice system offers substantial benefits to the criminal defendant. . . . Of course, "the power to be lenient [also] is the power to discriminate," but a capital-punishment system that did not allow for discretionary acts of leniency "would be totally alien to our notions of criminal justice."[146]

Singer contends that legal principles are not determinate, at least in part, when they are not "directive"—that is when they do not "help us choose among alternative possible rules."[147] One of the reasons suggested for nondirectiveness is ambiguity. For example, rules such as "be fair" do not tell

[146] 481 U.S. 279, 308, 311-12 (1987) (statistically shown racial bias in application of capital punishment not sufficient to render death sentence unconstitutional) (citations omitted).

[147] Singer, *supra* note 11, at 18.

us what the outcome will be in a given case. Nevertheless, Justice Powell, fully aware of the ambiguity in his approach, chose to insert discretion into the capital punishment scheme. In fact, the Court in another case struck down mandatory death sentencing—a considerably more determinate policy—in favor of the "particularized consideration of relevant aspects of the character and record of each . . . defendant."[148] This area of tolerance is purposely put into the law because of the perceived benefits of flexibility and discretion to the defendant and to society. Death penalty doctrine "outside the boundaries" is not ambiguous, however; capital punishment is clearly permitted for some offenses, and clearly not for others.

It is often undesirable to have determinacy without some tolerance. For example, imagine a scheme of mandatory sentencing that is completely determinate, with no tolerance. Such a scheme may, for instance, mandate that any adult convicted of possession of a certain quantity of a drug be sentenced to five years imprisonment. This means that an eighteen-year-old first offender would get the same sentence as a hardened drug dealer. If we wish to have any system to resolve disputes, some tolerance is necessary. How else are we to "prevent cruelty?"[149]

Singer suggests yet another area that could be called tolerance within the law. He contends that judges act as if the choice of rules is severely restricted, even though it is really infinite. Singer uses the example of injury caused by faulty auto repairs.[150] He points to alternatives to the traditional solutions of negligence and strict liability, such as universal auto insurance and mass transit. For judges, however, the choice of rules is usually restricted, even in cases of first impression. Mandating universal insurance and abolishing cars in favor of subways are indeed possibilities, but not possibilities usually open to the judge. Singer ignores the difference in choice of rules between judicial decisionmaking and legislative decisionmaking.

Because there is some limit on the number of choices that a judge has when deciding a case, even the area of tolerance in judicial decisionmaking is not entirely uncertain. Just as with quantum mechanics, one may not be able to predict the outcome of a given case, but when a large number of cases are decided, the choices are restricted and some probability of an outcome can be determined.

When tolerance is allowed or inserted into the law, its scope, and how it may cause gender, race, and other hierarchical bias are matters to be considered by society. Within tolerance, however, the law cannot be made to "tell us what to do."[151] It is effectively impossible in the law, as it is in science, to be completely determinate. Within the boundaries of the tolerance,

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[148] Woodson v. North Carolina, 428 U.S. 280, 303 (1976).

[149] Singer, *supra* note 11, at 67.

[150] *Id.* at 15.

[151] *Id.* at 19.

there must be flexibility. This does not mean, however, that we are uncertain or ambiguous about all of the law, or that the law is completely indeterminate.

b. *Scale*

The concept of certainty with a relatively small area of tolerance does not cover all laws. Some bodies of law are much less deterministic than others. Thus, a concept of scale plays a part in some areas of the law. For example, when a driver is stopped for a traffic violation, but the encounter escalates into an unrelated search for drug possession, we move into a different area or "scale" of law. The traffic violation itself may fall into the category of laws that are reasonably determinate, within a principle of tolerance. In contrast, the search may fall within an area that is governed by principles that are more indeterminate. The best examples of such principles are constitutional doctrines. Constitutional doctrines are not as clear as ordinary rules of law, and often difficult to apply in specific cases. Decisions in this area are more likely to be motivated by cultural and political bias.

The difference between traffic laws and constitutional principles is roughly analogous to the idea of scale. So long as an event remains within an area of law that is reasonably determinate, such as the traffic laws, the indeterminate political and hierarchical bias of the law is insignificant. At the point the event crosses the boundary into an area that is governed by more indeterminate principles, it has entered a different scale of the law.

Singer points out that rules at varying levels of generality can cause indeterminacy.[152] He contends that there is always an overriding principle that can trump the most determinate of laws.[153] This does not happen, however, unless an event has passed into an area governed by "larger scale" issues of law. Einstein's laws always apply to the behavior of physical bodies; it is just that Newton's laws describe that behavior equally well and much more simply at low velocities. It is only when the speed of light is approached that it is necessary to invoke the new physics. Similarly, "larger" issues of law may be present in more determinate areas of law, but they are not significant to the outcome until the event passes into the "larger scale" of the law.[154]

2. *Objectivity*

The scientific method does not guarantee an absolute "objective" reality. Instead, it provides a system for refining hypotheses. Modern physics has shown that the laws of nature cannot define an occurrence at the sub-

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152 *Id.* at 17.
153 *Id.* at 22.
154 *See also supra* note 124 and accompanying text.

microscopic scale, but can only define the probability of such an occurrence. This does not mean, however, that all reality is lost. As Heisenberg said:

> One can interpret the probability waves of the Bohr-Kramers-Slater theory as a quantitative rehabilitation of the concept of dynamics, of potentiality, or of the later Latin concept of potentia in the Aristotelian philosophy. A decisive role is played in this philosophy by the idea that events are not necessarily determined but that the possibility of or tendency toward an occurrence constitutes a kind of reality—*an intermediate layer of reality situated halfway between the bulky reality of matter and the spiritual reality of the idea or picture.* This idea has won a new place for itself in modern quantum physics, and the possibility for the mathematical formulation of natural laws.[155]

Within the law there is also an "intermediate" layer of reality. Singer proposes that we make decisions by "having conversations";[156] and yet he has shown that conversations often lead nowhere.[157] In order to come up with the solution to a problem, at some point we must *stop* conversing and decide. In order to stop conversing and start deciding, we must assume a basis on which to found our decision. This basis may be a tendency, a possibility, a potentia, rather than an outside or purely objective foundation.

Heisenberg wrestled with this problem in the context of physics:

> Here again we are brought up sharply before the rock-bottom truth that in science we are not dealing with nature itself but with the science of nature—that is, with a nature which has been thought through and described by man. *This is not to introduce an element of subjectivity into science, for it is in no way asserted that events in the world of nature depend on our observation of them;* it is simply to say that science stands between man and nature and that we cannot renounce the application of concepts that have been intuitively given to or are inborn in man.[158]

The consequence of Heisenberg's idea is that we are trapped within our own reality. The scientist knows that the reality he works with every day is filtered through a human brain.[159] But there is no choice. If the scientist is to know the world, it is the only way in which it can be explored.

Similarly, the judge must filter the law through his own human brain. The judge may be, and should be, aware of the possibility of cultural bias in making a decision, but the decision must be made. He tries to find rules and principles

155 Heisenberg, *supra* note 56, at 110 (emphasis added).

156 Singer, *supra* note 11, at 62, 65.

157 *Id.* at 38-39.

158 Heisenberg, *supra* note 56, at 112 (emphasis added).

159 Ultimately, even the idea that observations are a result of the observer, or that perception is a result of culture, is culturally and humanly based.

that are as objective as possible—that represent potentia. A good judge does the best he can, but at some point the judge is trapped in his own reality, just as the scientist is. He is dealing with law that has been "thought through and described by man." That does not invalidate the judge's endeavor, any more than the scientist's. If we are to "prevent cruelty," to "alleviate misery," and to "alter the social conditions that cause loneliness,"[160] we must start somewhere.

Singer asserts that a substantive foundation for law must be described accurately for it to be genuine, and that the usual sources for a substantive foundation are too general to describe it accurately.[161] I propose that accuracy in the description of legal foundation is like accuracy in science; some Gaussian scatter always exists. It is impossible to be one hundred percent accurate. This does not invalidate science, nor should it invalidate law.

There are two ways in which a tendency or possibility can give us an intermediate reality in the law. The first has to do with laws that are created for practical reasons. For example, it is necessary to have traffic regulations to prevent accidents and deaths. There may be no objectively rational reason or God-given foundation to drive on the right as opposed to the left, or to have red lights rather than blue ones. It is sensible, however, to have some system on which everyone agrees, or else great suffering will result. Thus, a law may not be ultimately grounded in some transcendental foundation, and yet have an intermediate reality that gives it rationality.

The second type of intermediate reality is the process of law that can be roughly analogized to scientific process. The process of both judicial or common law and legislative "experimentation" allows us to refine laws. If society permits and encourages it, the process can be corrective in nature. Does this process make the law "right" in a fundamental sense? No, but, it can form the intermediate reality of a body of rules that are used when they work and are changed when they cease to make sense. This is not to say that the process is perfect, or that the rules always produce desirable outcomes. Society must make the process more accessible to groups and individuals who have no access now. The process of the scientific method continues, even though the results we get may be startling, and cause us to question the foundations of our thinking. Similarly, the legal process continues to be used, even though the results may cause us to question the rationality of the law.[162] If we are to know the world and govern ourselves, we must work with what we have.

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160 Singer, *supra* note 11, at 67-69.

161 *Id.* at 29-30.

162 *See supra* note 143 and text immediately following.

3. *Neutrality*

Singer's view of traditional legal theory includes a concept of neutrality.[163] The two claims embodied in this concept are the relativistic notions that individuals should be allowed their own vision of "freedom and the good life," and that limits to freedom should be based on independent principles that do not presuppose a concept of good.[164] In these two claims, Singer sees a series of dichotomies that he claims "liberals" use to divide the world.[165]

Singer's dichotomies can be analogized to the famous "wave/particle" duality in quantum mechanics. One such dichotomy is the subjective/objective split. In law we think of a standard as being objective if it is general—what would a reasonable person think in this situation? A subjective standard is one that is individualized—what did this person think? The concepts, however, are not mutually exclusive. Objectivity, of necessity, contains some subjective element. A reasonable person in the mind of a juror is what that juror sees as reasonable. Subjectivity also contains some element of objectivity. A person's subjective thought cannot be known entirely by another; some element of common experience must take part in the standard.

Singer claims that the dichotomies such as the objective/subjective split are no longer useful.[166] However, it may be useful to think of some concepts in terms of dichotomies, just as scientists think of sub-atomic phenomena in terms of a wave/particle duality. Quantum mechanics transcends the wave/particle duality. Scientists know that sub-atomic phenomena do not really have such a duality, but they use it to describe and think about phenomena. Similarly, we may think of legal concepts in terms of dichotomies, even though we know them to be artificial, because they help us think and describe what we mean.

We have seen that Einsteinian relativity is not really more relative than the Newtonian concept of relativity; only that concepts of time, rather than scientific laws, are not absolute. The absolute has not been abolished. Time is no longer an absolute, instead the speed of light is absolute.

An analogous concept in law is the "liberal" vision of "freedom and the good life."[167] This concept must encompass some moral and political stand against a view that does not recognize individuality. This is the absolute that allows a legal concept that is otherwise relativistic. It may be that we should, as a society, re-examine what we hold as absolute. Traditional legal theory may indeed justify hierarchies, but not because of an incomplete relativism. Complete relativism in law is as impossible as it is in science. Instead, the

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[163] Singer, *supra* note 11, at 40.
[164] *Id.*
[165] *Id.*
[166] *Id.* at 46.
[167] *Id.* at 40–41.

wrong principles may be held as absolutes.[168] The criticisms of traditional law made by CRITs might lead us to discover new principles to hold absolute, in order to abandon the old ones to relativity. But as Einstein showed us, relativity is impossible without some principle that is absolute.

V. Conclusion

A professor of law comes out of his office at Harvard, gets into his car and prepares to drive home. This particular professor is an irrationalist CRIT. He understands the concepts of nihilism and its relationship to traditional legal theory better than any man or woman on Earth. Ideas of determinacy, neutrality, and objectivity in the law hold no sway with him. He also knows that there are other cars, red lights, and policemen on the city streets.

The central question is this: How does the professor drive his car?

Elise Porter

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[168] We may, of course, hypocritically claim to hold one thing as an absolute while in reality using another concept as a basis for decision.